

SN54HCT04, SN74HCT04 HEX INVERTERS

SCLS042B – JULY 1986 – REVISED MAY 1997

- Inputs Are TTL-Voltage Compatible
- Package Options Include Plastic Small-Outline (D), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

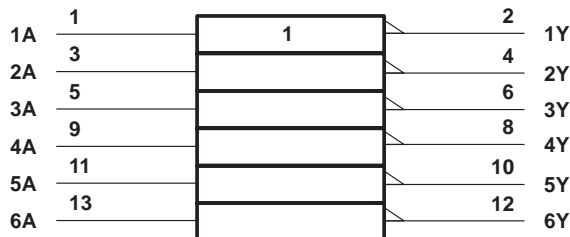
These devices contain six independent inverters. They perform the Boolean function $Y = \bar{A}$ in positive logic.

The SN54HCT04 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HCT04 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

logic symbol†



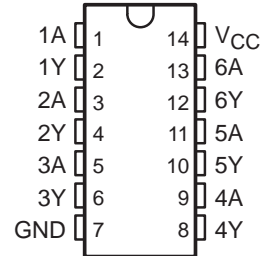
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the D, J, N, and PW packages.

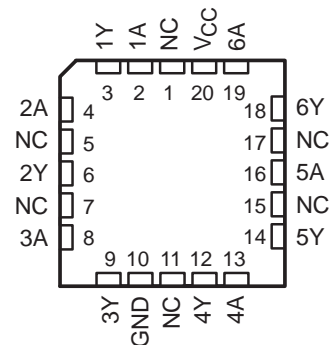
logic diagram (positive logic)



SN54HCT04 . . . J OR W PACKAGE
SN74HCT04 . . . D, N, OR PW PACKAGE
(TOP VIEW)



SN54HCT04 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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absolute maximum ratings over operating free-air temperature range†

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1)	± 20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 25 mA
Continuous current through V_{CC} or GND	± 50 mA
Package thermal impedance, θ_{JA} (see Note 2): D package	127°C/W
N package	78°C/W
PW package	170°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

		SN54HCT04			SN74HCT04			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 4.5$ V to 5.5 V			2			V
V_{IL}	Low-level input voltage	$V_{CC} = 4.5$ V to 5.5 V			0			V
V_I	Input voltage	0	V_{CC}		0	V_{CC}		V
V_O	Output voltage	0	V_{CC}		0	V_{CC}		V
t_t	Input transition (rise and fall) time	0	500		0	500		ns
T_A	Operating free-air temperature	-55	125		-40	85		°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HCT04		SN74HCT04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$V_I = V_{IH}$ or V_{IL}	4.5 V	$I_{OH} = -20 \mu\text{A}$		4.4		4.4		V	
			$I_{OH} = -4 \text{ mA}$		3.98		3.7			
V_{OL}	$V_I = V_{IH}$ or V_{IL}	4.5 V	$I_{OL} = 20 \mu\text{A}$		0.001		0.1		V	
			$I_{OL} = 4 \text{ mA}$		0.17		0.26			
I_I	$V_I = V_{CC}$ or 0	5.5 V	± 0.1		± 100		± 1000		nA	
I_{CC}	$V_I = V_{CC}$ or 0, $I_O = 0$	5.5 V	2		40		20		μA	
ΔI_{CC}^\ddagger	One input at 0.5 V or 2.4 V, Other inputs at 0 or V_{CC}	5.5 V	1.4		2.4		3		2.9	mA
C_i		4.5 V to 5.5 V	3		10		10		10	pF

‡ This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V_{CC} .



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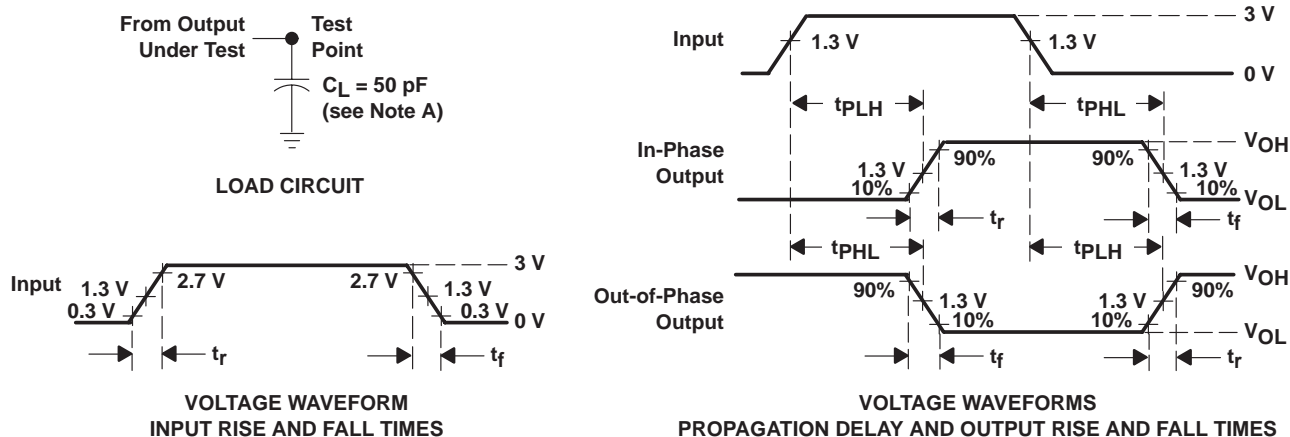
switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC}	T _A = 25°C			SN54HCT04		SN74HCT04		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y	4.5 V		14	20	30		25		ns
			5.5 V		13	18	27		23		
t _t		Y	4.5 V		9	15	22		19		ns
			5.5 V		8	14	20		17		

operating characteristics, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance per inverter	No load	20	pF

PARAMETER MEASUREMENT INFORMATION



- NOTES:
- C_L includes probe and test-fixture capacitance.
 - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - The outputs are measured one at a time with one input transition per measurement.
 - t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

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